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## CONCERNING COMBINED FILLINGS.

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Most practitioners of dentistry will, I think, readily indorse the statement that of the many materials used for filling teeth there is not one that does not fall far short of fulfilling the requirements of what might be styled the perfect or ideal filling-material. It is equally indisputable that the advantages or disadvantages of the various materials manifest themselves in various degrees in different classes of cavities, as well as often in different parts of one and the same cavity.

For instance, in compound cavities gutta-percha serves its purpose excellently at the neck of the tooth, decreasing in efficiency rapidly as it is carried toward the grinding-surface; while the cements, which may occasionally serve a good purpose at the grinding-surface, generally become worthless as we approach the neck of the tooth.

These well-recognized facts not only suggest the idea of an eclectic practice, but have already given rise to the employment of various combinations of two or more materials for filling one and the same cavity. Furthermore, experiments in the laboratory, as well as experience in practice, have established the fact that for certain cases two materials thoroughly combined or mixed together, *before introducing into the cavity*, may give a much better result than either of the ingredients used alone.

We accordingly recognize two classes or categories of combined fillings,—those in which different parts of the same cavity are filled with different materials, and those in which the materials are so mixed that the filling has the same character throughout. The former might be designated as jointed fillings, the latter as mixed fillings.

In the following lines I desire to call attention to some of the methods of combining different filling-materials which have been recommended, and in part have stood the test of practical application.

The results thus far obtained have been sufficiently encouraging, I think, to merit more attention than has apparently as yet been bestowed upon them. Of the eighteen to twenty different combinations reported upon, some I shall only mention for the purpose of obtaining a general survey of the subject; others I shall discuss more at length as their importance may seem to demand.



*1. Combinations in which a Layer of One Substance is introduced between the Bottom of the Cavity and the Filling Proper, as a Protection to the Pulp.*

Recent communications upon this subject have added nothing new either in regard to materials or methods of manipulation, unless we except the experiments of Gilmer on the conductivity of different materials used in filling teeth (*Dental Review*, December, 1891). A completely reliable study of the comparative conductivity of different materials, as that of Gilmer appears to be, would often be of great service in determining what material should be used in filling teeth abnormally sensitive to changes of temperature.

*2. Joint Fillings of Non-cohesive and Cohesive Gold.*

Many dentists still indorse the practice of combining non-cohesive and cohesive foils, with a view to utilizing the particular advantages claimed for each preparation in the same cavity.

In large approximal cavities a peldorf of non-cohesive gold is placed upon the cervical wall and followed up by cohesive gold; or in case of the front teeth, the cervical and lingual walls may be covered with non-cohesive gold; or, finally, all the walls of the cavity may be lined with it and only the central portion of the filling made of cohesive gold, which serves as a key to bind the whole together.

The reasons given for this practice have been frequently pointed out, and must be familiar to everyone. From my own experience and observation I can only indorse the procedure, though in my practice tin-gold has largely taken the place of non-cohesive gold in such operations.

The theoretical objection to this method, that the undercut becomes filled up with non-cohesive gold and that the cohesive gold does not have sufficient anchorage, I have not found to be an objection in practice. On the other hand, in saucer-shaped cavities where I have found it difficult to adapt cohesive gold, I have occasionally overcome the difficulty by making the bulk of the filling with non-cohesive and finishing with cohesive foil.

*3. Joint Fillings of Tin and Gold.*

Spooner is reported to have used tin in combination with gold as much as fifty to sixty years ago, and in recent times it has been used quite extensively in pretty much the manner described under 2. A very thin layer of tin at the cervical margin was thought to adapt itself somewhat better than gold alone, and also, "in consequence of the oxidation of the tin," to produce a filling perfectly water-tight at the neck of the tooth, a condition which can be claimed for but a small proportion of cohesive gold fillings in practice. The two materials unite in a short time, so that the objection to the combination of cohesive and non-cohesive gold mentioned above does not hold here.

I have no experience in this manner of using tin, though I am in almost constant use of tin-gold for the same purpose (as described under 5), and with most satisfactory results.

#### 4. Mixed Fillings of Tin and Gold.

A thorough discussion of this combination would require more space for itself than I design to occupy for all the seventeen combinations to be considered in this article. The subject has, moreover, been repeatedly brought before the profession in late years, so that there is at present no particular call for an extended presentation of it, though I may return to it later.

It has been gratifying to me personally to see that this combination has won some warm friends in America, although on the whole it has met with considerable adverse criticism, chiefly from those who have tried it but little or, often, not at all, and whose opinions therefore are naturally entitled to less consideration than those of practitioners who have given the material a fair trial. Some of the remarks I have read concerning tin-gold do not quite come up to the standard set for unbiased scientific criticism. For example, Hungerford is credited with the statement (*Western Dental Journal*, May, 1891, p. 240) that non-adepts in the use of gold are the ones who favor the combination. Any one inclined to make use of the same style of argument could only reply, Then why doesn't H— favor it? There is of course nothing to be gained by this mode of discussion. Besides, if the combination of tin and gold fulfilled only a need of the non-adept, what a blessing it would be to the profession and the community!

As a matter of fact, however, there is not a man in the dental profession who is so proficient in the use of gold that he can afford to ignore materials which may not require for their successful manipulation quite as high a degree of skill as is required by gold. Finally, it is not difficult to find cases in which it requires much more skill to make a good filling of tin-gold or of non-cohesive gold than it does to pile up mountains of cohesive foil.

The position taken by Ottolengui (*DENTAL COSMOS*, February, 1892) appears to me to be also contrary to the experience of the great majority of the dental profession; when he argues that there is no need of new filling-materials. Repeatedly we are confronted by cases where we are obliged to ask ourselves, not the question, Which is the perfect filling-material for this cavity? but, Which has the fewest objectionable qualities?

The old song that failure of gold at the gingival margin is due to faulty manipulation does very well, but failure at the gingival margin continues to occur and will continue to occur, even in the hands of the most skillful and conscientious dentists, to say nothing of the dentist of average skill who makes up the great bulk of the dental profession.

All honor to gold, although it is far from being a perfect filling-material; but at the same time let us not attempt to discredit other materials, particularly when they have stood the test of over a quarter of a century, without having tested them with the same skill and patience and conscientiousness which we are called upon to cultivate in the use of gold.

Having used both gold, and tin and gold, for fifteen years, I can only say that I meet almost daily with cavities which I can fill better and with far more ease to myself and to my patient with tin-gold than with gold alone; and as there is no reason to suppose that I am different in this respect from everybody else, the inference is justified that

others who would give the material a fair trial might find the same. Besides, this is the testimony of a great many practitioners who have become thoroughly acquainted with the materials.

Naturally the manipulation of tin and gold is not learned in a day. The material must be inserted with care, and particularly those who have never learned the use of non-cohesive materials would probably encounter some difficulty. A badly condensed tin-gold filling will become brittle, sometimes powdery; a properly condensed one never. I may mention in this connection also that the rolls of tin-gold should never be made with sweaty or moist fingers, or be allowed to lie in a damp place before using. They may in such case become stiff and difficult to manipulate.

#### *5. Joint Fillings of Tin-Gold and Gold.*

This is a combination in which tin is extensively used in connection with gold by the advocates of tin-gold as a filling-material. Large cavities of almost every character, particularly, however, compound approximal cavities, are filled one-third to two-thirds with tin-gold, and the operation completed with cohesive foil. It has a very decided advantage over amalgam used in this way, in that the gold unites perfectly with the tin-gold to form a solid filling. The operation may also be completed in one sitting, and the tin-gold has better preserving properties than amalgam.

#### *6. Joint Fillings of Non-cohesive Gold followed by Tin-Gold.*

A class of cavities which requires to be treated with great care is formed by approximal cavities in frail incisors and cuspids, in which the lingual wall is partly or completely destroyed. For those who use non-cohesive gold in such cases the operation may be lightened by covering the labial wall with non-cohesive gold and filling the cavity one-half to two-thirds full with it, finishing with tin-gold. In making these fillings with non-cohesive foil, I think most operators will agree with me that by far the most difficult part is the insertion of the last few pellets on the lingual wall, where we have not been able to obtain an undercut.

One or two trials will convince anyone how much more readily this part of the operation may be performed with tin-gold. Of course, a filling of this kind has a gray color upon the lingual surface; from the front, if seen at all, it appears as a gold filling.

#### *7. Joint Fillings of Amalgam or Cement over Gold.*

This combination applies only to those cases where a thin layer of gold is placed against a thin wall of enamel to prevent the cement or amalgam from showing through. If the surface of the wall is first given a thin coat of varnish, the gold will adhere to it and keep in place while it is being fixed with the cement or amalgam. Where amalgam is used, Morrison (*Archives of Dentistry*, May, 1891) recommends gilded platinum, since it does not become amalgamated by the mercury.

#### *8. Joint Fillings of Amalgam and Gold.*

The practice of filling very large and difficult cavities one-third to two-thirds full with amalgam, and covering this with gold, has been

carried out to a considerable extent, but reports as to the manner in which such fillings have stood the test of time are still wanting. Their chief advantage over all-amalgam fillings is their appearance, and the better preservation of the teeth at the grinding-surface; their chief advantage over all-gold fillings is their ease of insertion, and, probably, in difficult cases, the better preservation of the tooth at the neck.

One of its great disadvantages, which it possesses in common with many other joint fillings, lies in the fact that the two parts of the filling do not unite with each other. It is often also a serious drawback that the operation requires two sittings for its completion.

I have seldom used it myself, because I consider the combination discussed under 5 preferable for most cases, since it gives a better adaptation of the filling at the neck of the tooth; both parts of the filling unite firmly together, and the operation may be completed in one sitting. I have occasionally used the amalgam and gold to advantage in distal cavities in the molars, in cavities involving the distal and buccal surfaces of bicuspids, filling the distal portion with amalgam and the buccal with gold.

A method of making amalgam-gold fillings in one sitting was described by Clapp (*DENTAL COSMOS*, 1888, p. 870), and should be referred to in this connection. The principal features in Clapp's process are: (1) The preparation of the cavity with square edges in the portion to be occupied by amalgam; (2) the adjustment of a perfectly fitting matrix; (3) the thorough condensation of the amalgam, which should be mixed dry; (4) the use of Steurer's plastic gold for beginning the gold portion of the filling. The first pieces are swallowed up, so to speak, by the amalgam, "but by persevering the gold will soon assert itself and overpower the amalgam." The filling may then be completed with any cohesive gold. The greatest care is necessary in every step of the operation. The meager reports which have appeared concerning the success of the Clapp operation in practice have been very favorable, and the article by Clapp (l. c.) should be referred to by all who are not converts to the pernicious doctrine that any tooth that is worth filling at all is worth filling with gold.

#### *9. Copper Amalgam and Alloy Amalgam.*

In order to take advantage of the saving properties of copper amalgam at the cervical wall, and at the same time avoid the discoloration\* of the tooth resulting from this material, as well as its tendency to wear away at the grinding-surface, it has been recommended to combine it with alloy amalgam.

I have had no opportunity to examine the few fillings of this kind that I have made. W. H. Trueman (*DENTAL COSMOS*, 1889, p. 238) is reported to have stated that copper amalgam, while not discolored the teeth when used alone, does have a tendency to do so when combined with gold or an alloy amalgam. He furthermore states that if the two amalgams are inserted at the same time, the alloy amalgam will not harden.

Whitney, on the other hand (*Ibid.*, 1889, p. 492), states that he is in the almost daily habit of covering copper amalgam with platinum

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\* According to my experience, copper amalgam well packed and kept perfectly free from moisture during the operation, very rarely discolors the tooth to any appreciable extent.

and silver alloys, with the best results as far as hardening and appearance are concerned. Likewise Russel (*International Dental Journal*, 1889, p. 654) writes, "Some alloys will join very readily, as I have proved by filling one-half of a glass tube with alloy and the remainder with copper amalgam. When hard the tube was broken, and it was impossible to break them apart at the joint."

#### 10. Cement or Amalgam over Gutta-percha.

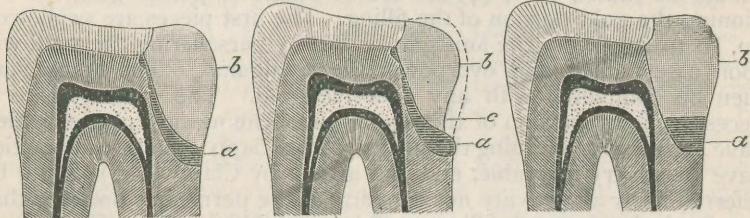
Gutta-percha is one of the best materials at our command in places not exposed to the action of mastication. It therefore performs good service at the cervical wall in approximal or compound approximal cavities; cement, on the other hand, is altogether unreliable at the cervical wall, but holds *comparatively* well on the grinding-surface. The combination of the two materials consequently often gives a filling somewhat better than gutta-percha alone, and far better than cement alone.

For the last ten years I have very rarely made a filling of phosphate cement in cavities extending under the gum without protecting the neck of the tooth with gutta-percha, extending a thin layer of this material over the bottom of the cavity as a protection to the pulp where it is nearly exposed (Fig. 1). These fillings are, however, in

FIG. 1.

FIG. 2.

FIG. 3.



one respect far from satisfactory. The cement not only wears away rapidly, but also disintegrates at the joint with the gutta-percha, so that fillings of this kind soon have the appearance seen in Fig. 2. The food wedges in between the teeth and accumulates at the point *c*, rendering it very difficult to keep the place clean. Notwithstanding this shirking of duty on the part of the cement, the intrinsic saving capacity of the gutta-percha protects the tooth from secondary decay. The result will be somewhat better when the gutta-percha is built up square, as in Fig. 3, though in this case it does not afford the same protection to the pulp. In like manner amalgam may be used as a capping for gutta-percha, and where the walls of the cavity are sufficiently strong, it gives a decidedly better result than cement.

In both cases a hard variety of gutta-percha should be used. I have found soft varieties to wash out, thereby rendering the result seen at *c* (Fig. 2) still more pronounced.

#### 11. Gutta-percha or Cement protected by a Thin Gold Plate.

This combination was occasionally used formerly in large cavities on the grinding-surface. The plate, cut to fit the opening of the cav-

ity as accurately as possible, has one or two short pins soldered to it at right angles to the surface, and is simply pressed upon the cement while yet soft, being retained by the pins as well as by the adhesion to the surface of the plate, which should be roughened. In case of gutta-percha fillings, the plate, of course, may be warmed before pressing into place.

### *12. Amalgam retained by Cement.*

On account of the tendency of amalgam fillings (manifested, it is true, to very different degrees in different preparations) to contract or draw away from the walls after insertion, retaining points or undercuts are imperative in all cavities which do not otherwise have a retaining form.\* Cases are, however, constantly occurring in which it would be of the greatest benefit, for reasons well known to every practitioner, if the necessity of making retaining points or undercuts could be avoided. For such cases it has been recommended, and to some extent practiced, to cover the bottom of the cavity with phosphate cement and to pack the amalgam immediately over it while the cement is still soft. The cement should be of a variety which possesses the greatest adhesive properties (they vary much in this respect), and should be mixed rather thin. It is well to press or prick the first portion of amalgam into the cement with a deeply serrated instrument.

Experience with this method has been limited as yet, but there is no question in my mind that it is worthy of trial. A few experiments made out of the mouth will soon convince one that the amalgam firmly adheres to the cement.

### *13. Gold retained by Cement.*

In a manner similar to that just described cement may serve to retain or help to retain gold fillings in shallow cavities. The bottom of the cavity is covered with cement in a soft condition, one or more pellets or pledges of cohesive gold pressed into it, care being taken that the upper surface of the gold does not become in any way contaminated by the cement. As soon as the latter is thoroughly hardened, the operation of building on the gold may be proceeded with. Naturally a very adhesive, quick-setting cement is desirable.

A somewhat different method of obtaining the same result has been recommended by Oltramare (*communication faite au Congrès odontologique suisse, le 4 Octobre, 1890*).

He uses a gold cake, prepared out of the mouth, which he presses upon the cement already partially hardened, at the same time warming the gold by means of a heated burnisher or by blasts of warm air. The cake is easily pressed into the cement, which has been resoftened by the heat and adheres firmly, while the cement quickly sets again and permits the operation to be proceeded with almost immediately.

Oltramare prepares the gold cake by condensing a number of gold cylinders or pellets upon the surface of a serrated steel plate, holding the gold with one instrument and condensing it with another. The cake must be adapted to the cavity in size and form, and being serrated on the under side it adheres very firmly to the cement if properly adjusted. Experiments out of the mouth give very promising results.

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\* An exception may be made in favor of some copper amalgams,

#### 14. *The Combination of Amalgam and Cement*

has in late years received considerable attention both in Europe and America.

The first reference to the method which I have met with in dental literature is found in a communication by Tileston to the *Dental Review* of August, 1888. In Germany Sachs has done much to introduce the operation; also Klemich (*Journal für Zahnheilkunde*, 1890, No. 11) writes that he has used the mixture for many years.

I have already described the method of mixing the materials, in the *DENTAL COSMOS* for January, 1891, p. 21, and have nothing essential to add to what has been said there. The cement should be of an adhesive (sticky) variety, and must be thoroughly incorporated with the amalgam, while the amalgam must be of the best quality and contain enough mercury to effect a complete amalgamation. Incorporated in a powdery condition, it may do more harm than good.

It is claimed that the combination does not contract on setting, and experience seems to confirm the claim. It appears to withstand both mechanical and chemical action much better than cement, and is a poorer conductor than amalgam; it is as easily inserted as cement, and is nearly as adhesive. It certainly deserves a trial. I use it almost altogether where I otherwise might be tempted or compelled to use cement, and have been very well pleased with the results. I do not, however, wish to be understood as unreservedly recommending the combination; experience has not yet been extended enough for that. In some cases I have found it to wear away at the grinding-surface. Its color is against it in some cases, though I have not found this an objection except for the upper front teeth. It may be varied almost at will, since it depends upon the color of the cement used and the proportion and quality of the amalgam, as well as upon the particular preparation of amalgam used.

In a case of extensive erosion of all the front teeth, where the patient would not think of having gold and cement had proved almost useless, I obtained results with cement and amalgam with which both the patient and myself were better pleased as to appearance than with cement, and which have already outlasted two cement fillings and still show but little sign of wear. I should say, however, that in this case the teeth were considerably darker than the average.

I have occasionally also found cement-amalgam very convenient for setting pivot teeth in forlorn cases, and must say that it has worked far better than cement alone. I should think it would be excellent for setting Logan crowns, but have no experience in that direction.

#### 15. *Combination of Gutta-percha with Alloy Filings, Tin, etc.*

Repeated attempts have been made to increase the hardness and resistance of gutta-percha by incorporating various inorganic substances into it. The world-renowned Hill's stopping is one of the results of these attempts. More recently it has been sought to attain the same end by softening the surface of the gutta-percha filling with chloroform (Butler), or with eucalyptol, or by heat, and then working filings of alloy into the superficial layers (Line). Finally, the softened gutta-percha has been kneaded together with metal filings before introducing it into the cavity, so that not only the outer layers but

the whole filling was permeated with the filings. Up to the present, however, no particular advantage seems to have been gained by these experiments.

In the February number of the *DENTAL COSMOS*, Line recommends a new method of combining tin with gutta-percha in which the filling is so made as to consist of alternate layers of gutta-percha and

FIG. 4.

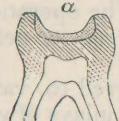
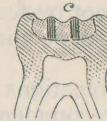


FIG. 5.



FIG. 6.



tin, so placed that the layers are parallel with the direction of the force in mastication. Fillings so made are observed to wear away much more slowly than gutta-percha fillings. (See Figs. 4-6, also consult original article, *DENTAL COSMOS*, 1892, p. 133.)

#### 16. Combinations of Cement with Alloy Filings or with Pulverized Porcelain.

Parker (*Ibid.*, 1890, p. 30) recommends very highly "zinc-phosphate and alloy filings mixed and prepared for filling as ordinary phosphate." Having used it for five years, he finds it far superior to any cement. He uses an alloy of silver, tin, and a little platinum. Alloys containing much zinc or copper should not be used. The cement should be the dento-plastique of The S. S. White Company, or something like it. "It has the qualities of any cement; secondly, it always presents a metallic surface, so that it is worn down very slowly by mastication; thirdly, as to conductivity it is better than either of the strictly metallic or cement preparations" (Parker, *l. c.*). Howe (*Ibid.*, 1890, p. 33) likewise speaks well of the mixture.

Perry (*Ibid.*, 1890, p. 32) has occasionally used pulverized artificial teeth mixed with the phosphate, sometimes with astonishingly good results, sometimes not. I have tested the method a few times, and suggested it in the *Oesterreichisch-Ungarische Vierteljahrsschrift*, January, 1887, but was not sufficiently encouraged by the results to continue the experiments.

#### 17. Combination of Glass or Porcelain with Amalgam or Gold.

Cases are frequently to be met with in which caries, beginning on the approximal surface of the upper incisors or cuspids, has destroyed a portion of the labial wall. Fillings of gold are naturally more or less conspicuous; cement is not much better, besides being very impermanent; porcelain or glass fillings cannot be inserted for want of space. For these cases Dall, of Glasgow, first recommended, I believe, to fill the lingual or approximal portion of such cavities with gold or amalgam, then to properly shape the labial or visible portion and insert a porcelain filling.

A case in which I was able to employ this combination to advantage was that of a superior first bicuspid, of which only a portion of the lingual cusp was still standing. The patient decidedly objected to a

crown as being artificial, and demanded something which would not be conspicuous by its color. I built up the crown with cement, which only partially satisfied her demands, and in a few months was of course very much worn down. I then restored the crown with amalgam, and when it had set, on the following day, prepared in that part of the filling which was visible from the front a box-shaped cavity with rounded corners, took an impression with No. 30 platinum gold, melted a glass filling, and set it in with phosphate cement. No one, except perhaps a dentist, conversing with the lady, would suspect that the tooth was not perfectly sound. The operation was performed only five months ago, so that not much can as yet be said as to its durability.

Besides the combinations already referred to, various others have been proposed or recommended, such as inlays of vulcanized rubber, combinations of Robinson's fibrous foil with gold, using mercury to establish the union between the two (McLeod, *DENTAL COSMOS*, 1890, p. 209). Furthermore, the use of two metals in combination for root-filings, in order to bring about an antiseptic action through the electric currents thus established, or, what seems to me to be of still more doubtful utility, the use of a wire of combination metal of tin, silver, and gold in the treatment of pulpless teeth to obtain an *electric stimulus*.



